

Product Specification

Amotec	Model: XTPW50SN04-01	Rev. No.	Issued Date.	Page.
		A	2017,03,14	1 / 19

Thin-Film-Transistor LCD Module
Model:XTPW50SN04-01

Acceptance

Approved and Checked by

Approved by	Checked by		Made by

Product Specification

Amotec	Model: XTPW50SN04-01	Rev. No.	Issued Date.	Page.
		A	2017,03,14	3 / 19

1.General Description and Features

XTPW50SN04-01 is a TM (Transmissive) type color active matrix TFT (Thin Film Transistor) liquid crystal display (LCD) that uses amorphous silicon TFT as a switching device. This model is composed of a TFT-LCD module, a driver circuit and a back-light unit . The resolution of a 5.0" contains 800RGBx480 dots . The following table described the features of XTPW50SN04-01.

LCD Module

Item	Specification	Unit
Screen Size	5.0 inches	Diagona
Display Resolution	800RGB(H)x480(V)	Dot
Active Area	108 (H) x 64.8 (V)	mm
Outline Dimension	120.7(W) x 75.8(H) x 2.95 (D)	mm
Display Mode	Normally white/Transmissive	--
Pixel Arrangement	RGB-Vertical Stripe	--
TP	-	--
Gray scale inversion Direction	6 o'clock	
Viewing Direction	12 o'clock	--
Drive IC	ILI6122*1 / ILI5960*1	--
Surface luminance	250 cd/m ²	

Product Specification				
Amotec	Model: XTPW50SN04-01	Rev. No.	Issued Date.	Page.
		A	2017,03,14	4 / 19

2.Mechanical Information

Item		Min.	Typ.	Max.	Unit	Note
Module Size	Horizontal (H)	--	120.7	--	mm	--
	Vertical (V)	--	75.8	--	mm	(1)
	Thickness (T)	--	2.95	--	mm	(2)
Weight		--	N/A	--	g	--

Note (1) Not include FPC.

Refer to the Outline Dimension for further information.

(2) Back-light unit are included.

3.Electrical Specifications

3.1 Absolute Max. Ratings

3.1.1 Absolute Ratings of Environment

If the operating condition exceeds the following absolute maximum ratings, the TFT LCD module may be damaged permanently.

($T_a=25\pm 2^\circ\text{C}$, $V_{SS}=\text{GND}=0$)

Item	Symbol	Min.	Max.	Unit	Note
Operating temperature	T_{OPR}	-20	70	$^\circ\text{C}$	(1)
Storage temperature	T_{STG}	-30	80	$^\circ\text{C}$	(1,2,3)

Note (1) 95 % RH Max. ($40^\circ\text{C} \geq T_a$). Maximum wet-bulb temperature at 39°C or less. ($T_a > 40^\circ\text{C}$)
No condensation.

Note (2) In case of below 0° , the response time of liquid crystal (LC) becomes slower and the color of panel becomes darker than normal one. Level of retardation depends on temperature, because of LC's character

Note (3) Only operation is guaranteed at operating temperature. Contrast, response time, another display quality are evaluated at $+25^\circ\text{C}$.

Product Specification

Amotec	Model: XTPW50SN04-01	Rev. No.	Issued Date.	Page.
		A	2017,03,14	5 / 19

3.2 Electrical Absolute Rating

3.2.1 TFT-LCD Module

(Voltage Referenced to VSS)

Item	Symbol	Value		Unit	Condition
		Min.	Max.		
Digital Power Supply Voltage	VDD	VSS-0.3	5.0	V	--

3.2.2 Back-Light Unit

(Ta=25±2°C)

Item	Symbol	Min.	Max.	Unit	Note
current	I _f	--	30	mA	(1)
voltage	V _R	--	5.0	V	(1)

Note (1) Permanent damage to the device may occur if maximum values are exceeded or reverse voltage is loaded. Functional operation should be restricted to the conditions described under normal operating conditions.

Product Specification

Amotec	Model: XTPW50SN04-01	Rev. No.	Issued Date.	Page.
		A	2017,03,14	6 / 19

4 Electrical Characteristics

4.1 Backlight Unit

The back-light system is an edge-lighting type with twelve white LEDs (Light Emitting Diode).

(Ta=25±2°C)

Item	Symbol	Value			Unit	Condition
		Min.	Typ.	Max.		
LED Voltage	V _F	16.8	18.6	20.4	V	
LED Current	I _F	-	40	-	mA	
Power Consumption	P _{BL}	-	744	-	mW	

Note (1) $P_{BL} = V_F \times I_F$

Product Specification

Amotec	Model: XTPW50SN04-01	Rev. No.	Issued Date.	Page.
		A	2017,03,14	7 / 19

5 Input Terminal Pin Assignment

PIN.N O	SYMBOL	I/O/P	FUNCTI	MEMARK
1	VLED-	P	POWER FOR BACKLIGHT (GROUN)	
2	VLED+	P	POWER FOR BACKLIGHT(ANODE)	
3	GND	P	GROUN	
4	VDD	P	VOLTAGE	
5-12	R0-R7	I/O	RED DATA	
13-20	G0-G7	I/O	GRREN DATA	
21-28	B0-B7	I/O	BIUE DATA	
29	GND	P	GROUN	
30	DCLK	I	Clock for input data. Data latched at rising/falling edge of this signal. Default is falling edge.	
31	DISP		DISPLAY ON/OFF	
32	HSYN	I	Horizontal sync input in digital parallel RGB. Negative polarity. ¹	
33	VSYN	I	Vertical sync input in digital parallel RGB. Negative polarity.	
34	DE	I	Input data enable control. When DE mode, active High to enable data input. (Normally pull low)	
35	NC		NO CONNECT	
36	GND	P	GROUN	
37	XR (NC)		NO CONNECT	
38	YD (NC)		NO CONNECT	
39	XL (NC)		NO CONNECT	
40	YU (NC)		NO CONNECT	

Product Specification

Amotec	Model: XTPW50SN04-01	Rev. No.	Issued Date.	Page.
		A	2017,03,14	8 / 19

6 Optical Characteristics

Item	Symbol	Condition	Values			Unit	Remark
			Min.	Typ.	Max.		
Viewing angle (CR \geq 10)	θ_L	$\Phi=180^\circ$ (9 o'clock)	60	70	-	degree	Note 1
	θ_R	$\Phi=0^\circ$ (3 o'clock)	60	70	-		
	θ_T	$\Phi=90^\circ$ (12 o'clock)	40	50	-		
	θ_B	$\Phi=270^\circ$ (6 o'clock)	60	70	-		
Response time	T_{ON}	Normal $\theta=\Phi=0^\circ$	-	10	20	msec	Note 2 Note 3
	T_{OFF}		-	15	30		
Contrast ratio	CR		400	500	-	-	Note 4
Color chromaticity	W_X		0.26	0.31	0.36	-	Note 5
	W_Y		0.28	0.33	0.38	-	
Transmittance	Tr		3.73	4.66		%	

Test Conditions:

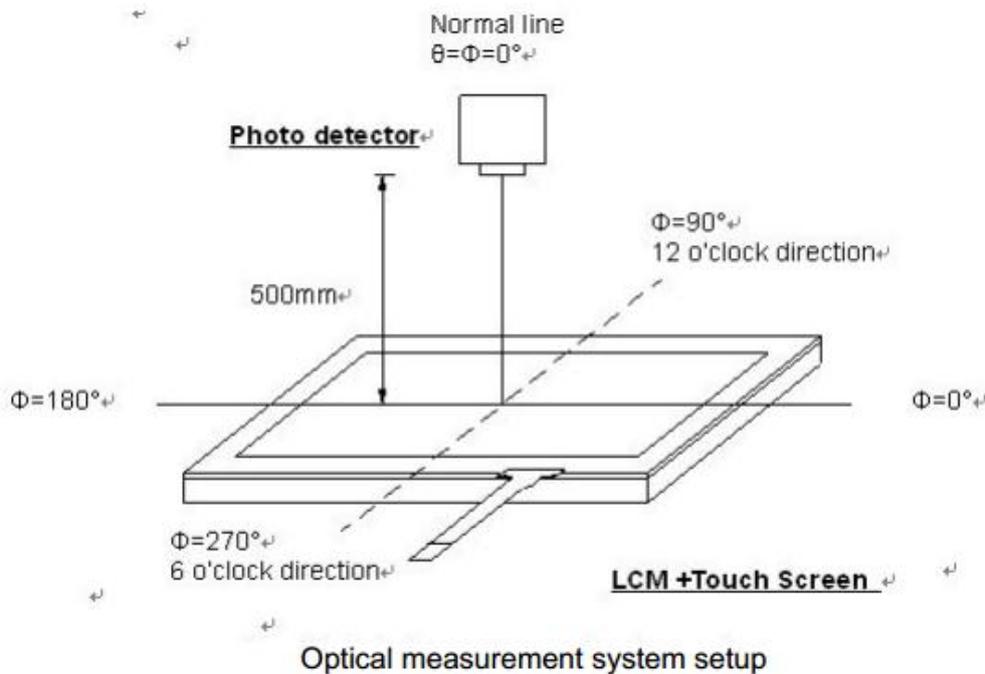
1. $V_{CC}=3.3V$, $V_{LED}=5.0V$.The ambient temperature is $25^\circ C$.
2. The test systems refer to Note 2.

Product Specification

Amotec	Model: XTPW50SN04-01	Rev. No.	Issued Date.	Page.
		A	2017,03,14	9 / 19

Note 1: Definition of optical measurement system.

The optical characteristics should be measured in dark room. After 30 minutes operation, the optical properties are measured at the center point of the LCD screen. (Response time is measured by Photo detector TOPCON BM-7, other items are measured by BM-5A/Field of view: 1° /Height: 500mm.)



Note 2: Definition of color chromaticity (CIE1931)

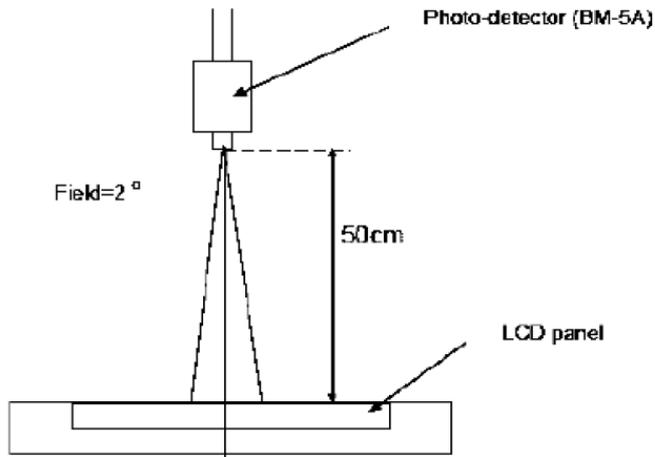
Color coordinates measured at center point of LCD.

Note 3: All input terminals LCD panel must be ground while measuring the center area of the panel. The LED driving condition is $V_{LED} = 5.0V$.

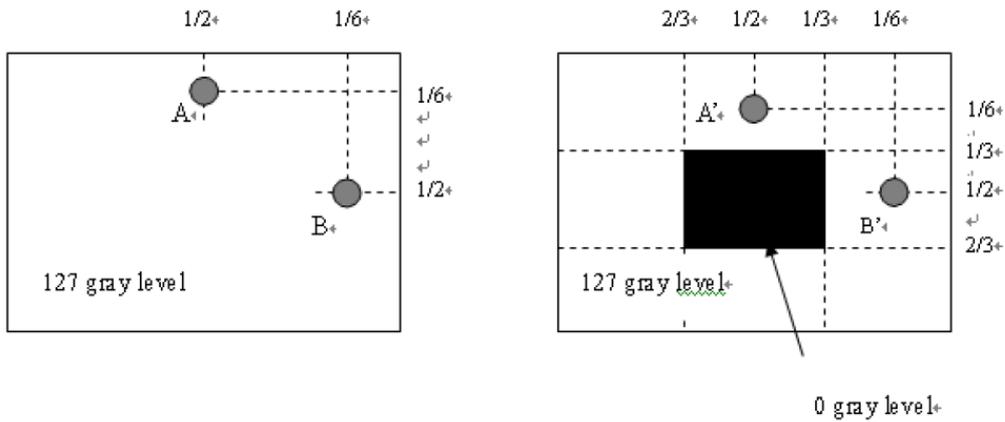
Product Specification

Amotec	Model: XTPW50SN04-01	Rev. No.	Issued Date.	Page.
		A	2017,03,14	10 / 19

Note 9: Optical characteristic measurement setup.



Note 10:



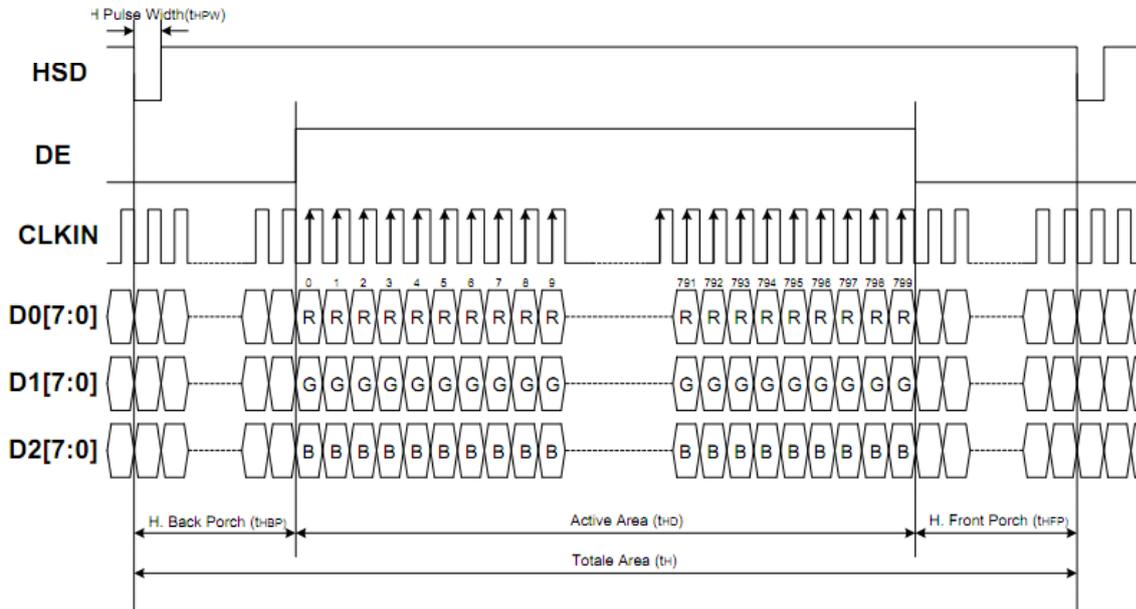
$|LA - LA'| / LA \times 100\% = 2\% \text{ max.}$, LA and LA' are brightness at location A and A'

$|LB - LB'| / LB \times 100\% = 2\% \text{ max.}$, LB and LB' are brightness at location B and B'

Product Specification

Amotec	Model: XTPW50SN04-01	Rev. No.	Issued Date.	Page.
		A	2017,03,14	11 / 19

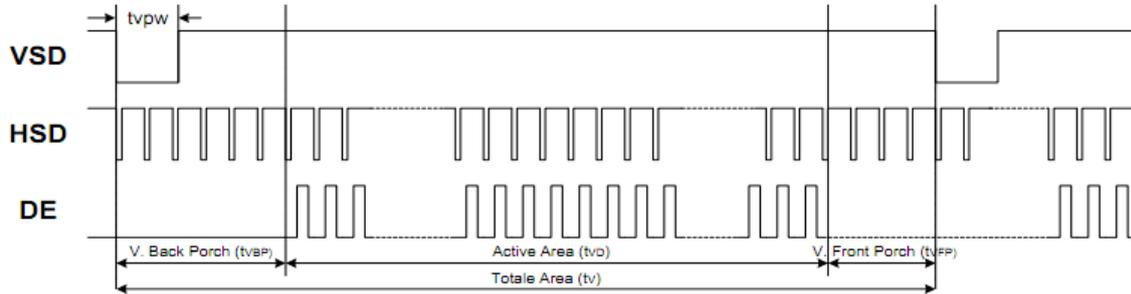
7 Interface Timing



Horizontal Input Timing						
Parameter	Symbol	Value			Unit	
		Min.	Typ.	Max.		
Horizontal display area	t_{HD}	--	800	--	CLKIN	
CLKIN frequency	f_{CLK}	--	33.3	50	MHz	
1 Horizontal line period	t_H	862	1056	1200	CLKIN	
HSD pulse width	Min.	--	1	--	CLKIN	
	Typ.	--	--	--	CLKIN	
	Max.	--	40	--	CLKIN	
HSD back porch	SYNC	t_{HBP}	46	46	46	CLKIN
HSD front porch	SYNC	t_{HFP}	16	210	354	CLKIN

Product Specification

Amotec	Model: XTPW50SN04-01	Rev. No.	Issued Date.	Page.
		A	2017,03,14	12 / 19



Vertical Input Timing					
Parameter	Symbol	Value			Unit
		Min.	Typ.	Max.	
Vertical display area	t_{VD}	--	480	--	HSD
VSD period time	t_V	510	525	650	HSD
VSD pulse width	t_{VPW}	1	--	20	HSD
VSD back porch	t_{VBP}	23	23	23	HSD
VSD front porch	t_{VFP}	7	22	147	HSD

Product Specification

Amotec	Model: XTPW50SN04-01	Rev. No.	Issued Date.	Page.
		A	2017,03,14	13 / 19

8 Reliability Condition for LCD

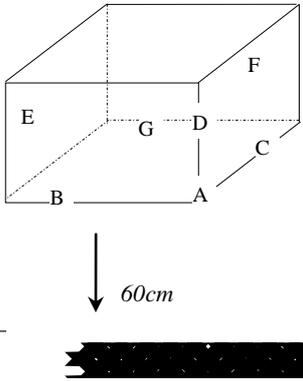
No change on display and in operation under the following test condition.

Condition: Unless otherwise specified, tests will be conducted under the following condition.

Temperature: 20±5°C Humidity: 65±5%RH

Tests will be not conducted under functioning state.

No.	Parameter	Condition	Notes
1	High Temperature Operating	70°C±2°C, 240hrs (Operation state)	--
2	Low Temperature Operating	-20°C±2°C, 240hrs (Operation state)	--
3	High Temperature Storage	80°C±2°C, 240hrs	--
4	Low Temperature Storage	-30°C±2°C, 240hrs	--
5	High Temperature and High Humidity Operation Test	60°C±2°C, 90%, 240hrs	--
6	Vibration Test	Total fixed amplitude: 1.5mm Vibration Frequency: 10~55Hz One cycle 60 seconds to 3 direction of X, Y, Z each 15 minutes.	--

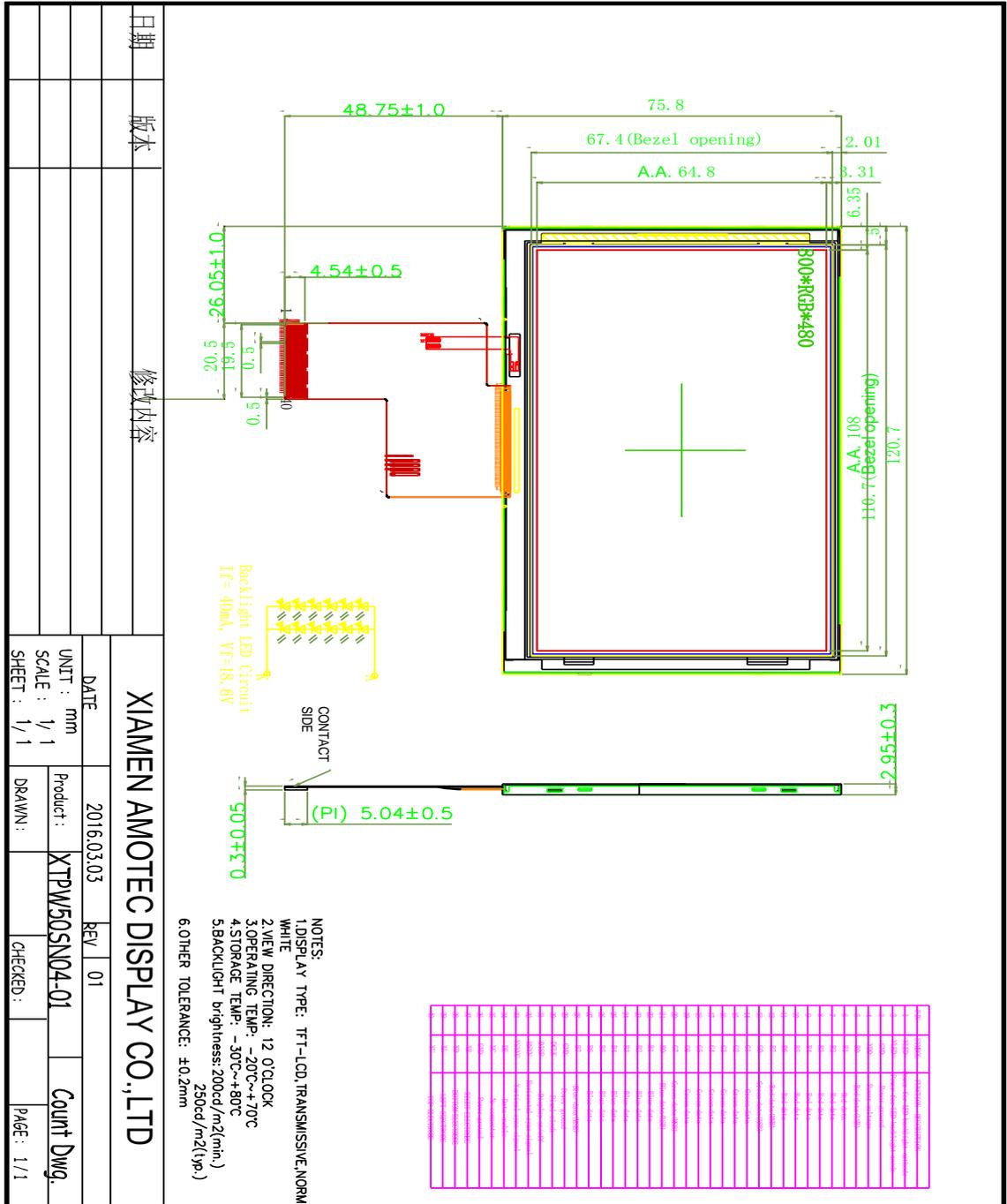
7.	Drop Test	<p>To be measured after dropping from 60cm high on the concrete surface in packing state.</p>  <p style="text-align: right;"> <i>Dropping method corner dropping</i> <i>A corner: once</i> <i>Edge dropping</i> <i>B, C, D edge: once</i> <i>Face dropping</i> <i>E, F, G face: once</i> </p> <p style="text-align: center;"><i>Concrete Surface</i></p>	--
----	-----------	--	----

- Notes:
1. No dew condensation to be observed.
 2. The function test shall be conducted after 4 hours storage at the normal temperature and humidity after removed from the test chamber.
 3. Vibration test will be conducted to the product itself without putting I in a container.

Product Specification

Amotec	Model: XTPW50SN04-01	Rev. No.	Issued Date.	Page.
		A	2017,03,14	14 / 19

9 Dimensional outlines



10 Incoming Inspection Standards

Product Specification				
Amotec	Model: XTPW50SN04-01	Rev. No.	Issued Date.	Page.
		A	2017,03,14	15 / 19

11.1 VISUAL & FUNCTION INSPECTION STANDARD

11.1.1 Inspection conditions

Inspection performed under the following conditions is recommended.

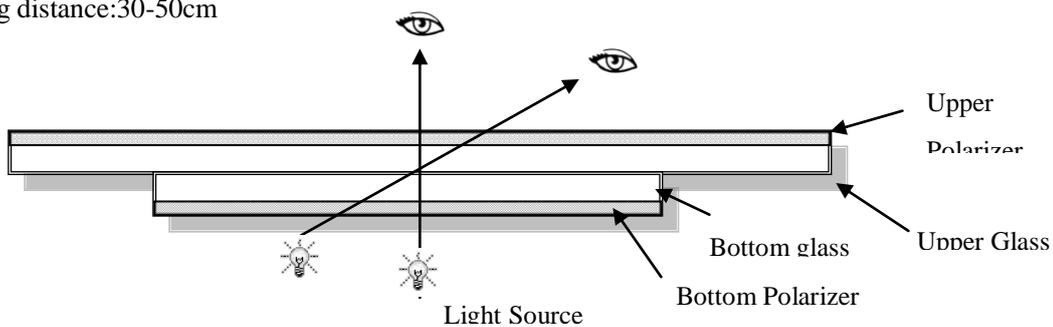
Temperature : $25 \pm 5^{\circ}\text{C}$

Humidity : $65\% \pm 10\% \text{RH}$

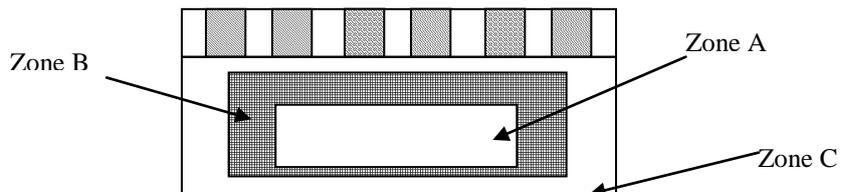
Viewing Angle : Normal viewing Angle.

Illumination: Single fluorescent lamp (300 to 700Lux)

Viewing distance:30-50cm



11.1.2 Definition



Zone A : Effective Viewing Area(Character or Digit can be seen)

Zone B : Viewing Area except Zone A

Zone C : Outside (Zone A+Zone B) which can not be seen after assembly by customer .)

Note:

As a general rule ,visual defects in Zone C can be ignored when it doesn't effect product function or appearance after assembly by customer.

11.1.3 Sampling Plan

According to GB/T 2828-2003 ; , normal inspection, Class II

AQL:

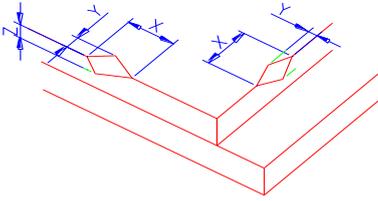
Product Specification				
Amotec	Model: XTPW50SN04-01	Rev. No.	Issued Date.	Page.
		A	2017,03,14	16 / 19

Major defect	Minor defect
0.65	1.5

LCD: Liquid Crystal Display , TP: Touch Panel , LCM: Liquid Crystal Module

No	Items to be inspected	Criteria	Classification of defects
1	Functional defects	1) No display, Open or miss line 2) Display abnormally, Short 3) Backlight no lighting, abnormal lighting. 4) TP no function	Major
2	Missing	Missing component	
3	Outline dimension	Overall outline dimension beyond the drawing is not allowed	
4	Color tone	Color unevenness, refer to limited sample	Minor
5	Soldering appearance	Good soldering , Peeling off is not allowed.	
6	LCD/Polarizer/TP	Black/White spot/line, scratch, crack, etc.	

11.1.4 Criteria (Visual)

Number	Items	Criteria(mm)						
1.0 LCD Crack/Broken	(1) The edge of LCD broken	 <table border="1" data-bbox="847 1619 1391 1774"> <thead> <tr> <th>X</th> <th>Y</th> <th>Z</th> </tr> </thead> <tbody> <tr> <td>≤3.0mm</td> <td><Inner border line of the seal</td> <td>≤T</td> </tr> </tbody> </table>	X	Y	Z	≤3.0mm	<Inner border line of the seal	≤T
X	Y	Z						
≤3.0mm	<Inner border line of the seal	≤T						

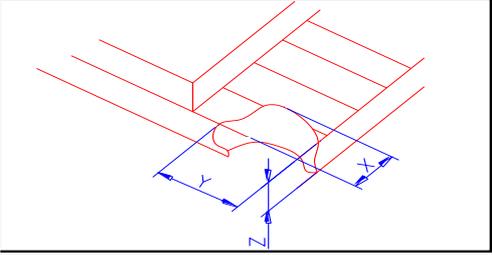
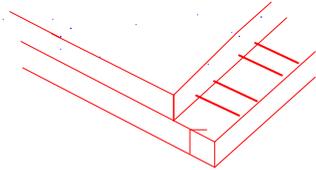
NOTE:

X: Length

Y: Width

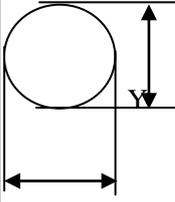
Product Specification

Amotec	Model: XTPW50SN04-01	Rev. No.	Issued Date.	Page.
		A	2017,03,14	17 / 19

<p>Z: Height L: Length of ITO, T: Height of LCD</p>	<p>(2) LCD corner broken</p>	 <table border="1" style="margin: auto; border-collapse: collapse;"> <thead> <tr> <th style="padding: 5px;">X</th> <th style="padding: 5px;">Y</th> <th style="padding: 5px;">Z</th> </tr> </thead> <tbody> <tr> <td style="padding: 5px;">$\leq 3.0\text{mm}$</td> <td style="padding: 5px;">$\leq L$</td> <td style="padding: 5px;">$\leq T$</td> </tr> </tbody> </table>	X	Y	Z	$\leq 3.0\text{mm}$	$\leq L$	$\leq T$
	X	Y	Z					
$\leq 3.0\text{mm}$	$\leq L$	$\leq T$						
<p>(3) LCD crack</p>	 <p style="text-align: center;">Crack Not allowed</p>							

Product Specification

Amotec	Model: XTPW50SN04-01	Rev. No.	Issued Date.	Page.
		A	2017,03,14	18 / 19

Number	Items	Criteria (mm)																																																																	
2.0	Spot defect  $\Phi = (X+Y)/2$	① light dot (LCD/TP/Polarizer black/white spot , light dot, pinhole, dent, stain) <table border="1" style="width: 100%; border-collapse: collapse; margin-top: 10px;"> <thead> <tr> <th rowspan="2" style="text-align: center;">Zone Size (mm)</th> <th colspan="3" style="text-align: center;">Acceptable Qty</th> </tr> <tr> <th style="text-align: center;">A</th> <th style="text-align: center;">B</th> <th style="text-align: center;">C</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">$\Phi \leq 0.10$</td> <td colspan="3" style="text-align: center;">Ignore</td> </tr> <tr> <td style="text-align: center;">$0.10 < \Phi \leq 0.15$</td> <td colspan="3" style="text-align: center;">3(distance $\geq 10\text{mm}$)</td> </tr> <tr> <td style="text-align: center;">$0.15 < \Phi \leq 0.2$</td> <td colspan="3" style="text-align: center;">1</td> </tr> <tr> <td style="text-align: center;">$0.2 < \Phi$</td> <td colspan="3" style="text-align: center;">0</td> </tr> </tbody> </table> ② Dim spot (LCD/TP/Polarizer dim dot, light leakage, dark spot) <table border="1" style="width: 100%; border-collapse: collapse; margin-top: 10px;"> <thead> <tr> <th rowspan="2" style="text-align: center;">Zone Size (mm)</th> <th colspan="3" style="text-align: center;">Acceptable Qty</th> </tr> <tr> <th style="text-align: center;">A</th> <th style="text-align: center;">B</th> <th style="text-align: center;">C</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">$\Phi \leq 0.1$</td> <td colspan="3" style="text-align: center;">Ignore</td> </tr> <tr> <td style="text-align: center;">$0.1 < \Phi \leq 0.2$</td> <td colspan="3" style="text-align: center;">2(distance $\geq 10\text{mm}$)</td> </tr> <tr> <td style="text-align: center;">$0.2 < \Phi \leq 0.3$</td> <td colspan="3" style="text-align: center;">1</td> </tr> <tr> <td style="text-align: center;">$\Phi > 0.3$</td> <td colspan="3" style="text-align: center;">0</td> </tr> </tbody> </table> ③ Polarizer accidented spot <table border="1" style="width: 100%; border-collapse: collapse; margin-top: 10px;"> <thead> <tr> <th rowspan="2" style="text-align: center;">Zone Size (mm)</th> <th colspan="3" style="text-align: center;">Acceptable Qty</th> </tr> <tr> <th style="text-align: center;">A</th> <th style="text-align: center;">B</th> <th style="text-align: center;">C</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">$\Phi \leq 0.2$</td> <td colspan="3" style="text-align: center;">Ignore</td> </tr> <tr> <td style="text-align: center;">$0.2 < \Phi \leq 0.5$</td> <td colspan="3" style="text-align: center;">2(distance $\geq 10\text{mm}$)</td> </tr> <tr> <td style="text-align: center;">$\Phi > 0.5$</td> <td colspan="3" style="text-align: center;">0</td> </tr> </tbody> </table>	Zone Size (mm)	Acceptable Qty			A	B	C	$\Phi \leq 0.10$	Ignore			$0.10 < \Phi \leq 0.15$	3(distance $\geq 10\text{mm}$)			$0.15 < \Phi \leq 0.2$	1			$0.2 < \Phi$	0			Zone Size (mm)	Acceptable Qty			A	B	C	$\Phi \leq 0.1$	Ignore			$0.1 < \Phi \leq 0.2$	2(distance $\geq 10\text{mm}$)			$0.2 < \Phi \leq 0.3$	1			$\Phi > 0.3$	0			Zone Size (mm)	Acceptable Qty			A	B	C	$\Phi \leq 0.2$	Ignore			$0.2 < \Phi \leq 0.5$	2(distance $\geq 10\text{mm}$)			$\Phi > 0.5$	0		
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Product Specification				
Amotec	Model: XTPW50SN04-01	Rev. No.	Issued Date.	Page.
		A	2017,03,14	19 / 19

	Line defect (LCD/TP /Polarizer black/white line, scratch, stain)	<table border="1"> <thead> <tr> <th rowspan="2">Width(mm)</th> <th rowspan="2">Length(mm)</th> <th colspan="3">Acceptable Qty</th> </tr> <tr> <th>A</th> <th>B</th> <th>C</th> </tr> </thead> <tbody> <tr> <td>$\Phi \leq 0.03$</td> <td>Ignore</td> <td colspan="3">Ignore</td> </tr> <tr> <td>$0.03 < W \leq 0.05$</td> <td>$L \leq 3.0$</td> <td colspan="2">$N \leq 2$</td> <td rowspan="2">Ignore</td> </tr> <tr> <td>$0.05 < W \leq 0.08$</td> <td>$L \leq 2.0$</td> <td colspan="2">$N \leq 2$</td> </tr> <tr> <td>$0.08 < W$</td> <td colspan="4">Define as spot defect</td> </tr> </tbody> </table>	Width(mm)	Length(mm)	Acceptable Qty			A	B	C	$\Phi \leq 0.03$	Ignore	Ignore			$0.03 < W \leq 0.05$	$L \leq 3.0$	$N \leq 2$		Ignore	$0.05 < W \leq 0.08$	$L \leq 2.0$	$N \leq 2$		$0.08 < W$	Define as spot defect			
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3.0	Polarizer Bubble	<table border="1"> <thead> <tr> <th rowspan="2">Zone Size (mm)</th> <th colspan="3">Acceptable Qty</th> </tr> <tr> <th>A</th> <th>B</th> <th>C</th> </tr> </thead> <tbody> <tr> <td>$\Phi \leq 0.2$</td> <td colspan="3">Ignore</td> </tr> <tr> <td>$0.2 < \Phi < 0.4$</td> <td colspan="3">2(distance ≥ 10mm)</td> </tr> <tr> <td>$0.4 < \Phi \leq 0.6$</td> <td colspan="3">1</td> </tr> <tr> <td>$0.6 < \Phi$</td> <td colspan="3">0</td> </tr> </tbody> </table>	Zone Size (mm)	Acceptable Qty			A	B	C	$\Phi \leq 0.2$	Ignore			$0.2 < \Phi < 0.4$	2(distance ≥ 10 mm)			$0.4 < \Phi \leq 0.6$	1			$0.6 < \Phi$	0						
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4.0	SMT	According to IPC-A-610C class II standard . Function defect and missing part are major defect ,the others are minor defect.																											